

KENTON COUNTY SCHOOLS TURKEY FOOT STEM CAMPUS



NEW
MIDDLE
SCHOOL
SITE

EXISTING
TURKEY
FOOT
MIDDLE
SCHOOL

PATTON
AREA
TECHNOLOGY
CENTER

CAYWOOD
ELEMENTARY
SCHOOL

New School Buildings Report

DISTRICT NAME	Energy Star	FACILITY NAME	Design Capacity	DESIGN AREA (from A/E Info)		Actual SF. per Student		Actual Cost At Construction	Cost per Sq. ft.	Bid Date	Actual Cost per Student
		Elementary Schools									
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J.A.Caywood Elementary School

TECHNOLOGICAL ACHIEVEMENTS

- *Daylight Harvesting*
- *Geothermal HVAC*
- *Only school in KY to receive 3 consecutive ENERGY STAR awards*

ENERGY USAGE AND SAVINGS

2006- 38 kBtu/sf/year
2007- 36 kBtu/sf/year
2008- 38 but/sf/year

ASHRAE 90.1
benchmark for schools in our
climate zone is
73 kBtu/sf/year with a goal of
achieving 51 kBtu/sf/year

Based on Kentucky's average
cost of energy
Caywood saves \$47,000/yr in
energy costs



YESTERDAY

trial, testing, data collection...

DESIGNING THE SCHOOL OF THE FUTURE

- Buildings use 40% of the total energy in the US. Renewable energy strategies can reduce the life cycle cost of energy and cut greenhouse gas emissions.
- The cost of operation of a school building over a 50 year period will exceed the cost of its construction.
- Construction is by no means a great teacher of innovation. Its resistance to change is mired in narrow or little vision, antiquated practices, and risk avoidance.

NET ZERO ENERGY AND LIFE CYCLE MINDSET

DEFINITIONS

- A zero energy building is a general term applied to a building with zero net energy consumption and zero carbon emissions annually. Zero energy buildings are autonomous from the energy grid supply - energy is produced on-site.
- A NET zero energy building uses the power grid to offset energy demands during peak times and contributes excess energy produced during low demand periods in such a way as to, over the course of a year, equal what is used when compared to what is produced.

"Education is for improving the lives of others and for leaving your community and world better than you found it."

Marian Wright Edelman

DESIGN PRINCIPALS

TOWARD ACHIEVING A NZ&LC BUILDING

POLICY

SCHOOL BOARD

- EMBRACE AND FOSTER A LIFE CYCLE AND SUSTAINABLE CULTURE
- BE WILLING TO COMMIT TAX DOLLARS IN CAPITAL CONSTRUCTION PROJECTS BEYOND LOWEST FIRST COST TO REDUCE BUILDING MAINTENANCE EXPENSES AND COST OF OPERATION
- ESTABLISH ENERGY GOALS AND INSTITUTE ONGOING ENERGY MANAGEMENT
- RE-THINK CURRENT PROCEDURES AND ACTIVITIES IN WAYS THAT WOULD USE LESS ENERGY
- ENGAGE STUDENTS IN THE PROCESS

IMPLEMENTATION

ARCHITECT

- PLANNING AND SITE DESIGN THAT MAXIMIZES NATURAL DAYLIGHTING OF THE MAJORITY OF A BUILDINGS OCCUPIED AND PROGRAMMED SPACES
- DESIGN A COMPACT BUILDING FOOTPRINT AND BUILDING VOLUME
- INCLUDE MATERIALS AND DEVELOP DETAILS THAT ENSURE A TIGHT BUILDING ENVELOPE
- INCLUDE MATERIALS AND FINISHES BASED ON COST EFFECTIVE LIFE CYCLE / RENEWABLE USE

ENGINEER

- DESIGN HVAC SYSTEMS THAT REQUIRE THE LEAST AMOUNT OF ENERGY TO PRODUCE A HEALTHY CONDITIONED ENVIRONMENT
- INCLUDE ENERGY MANAGEMENT CONTROLS TO ALLOW EFFICIENT OPERATION
- UTILIZE RENEWABLE STRATEGIES IN PLUMBING, HVAC, FIRE-SUPPRESSION, AND ELECTRICAL SYSTEMS

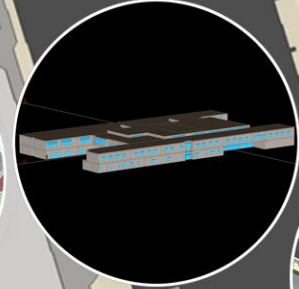
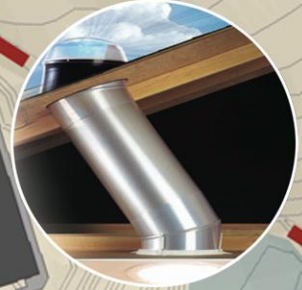
BUILDING OCCUPANTS

- VIGILANT DAY TO DAY ENERGY PRACTICES

TurkeyFoot Middle School

TECHNOLOGICAL ACHIEVEMENTS

- *Daylight Harvesting*
- *Geothermal HVAC*
- *Solar Light Tubes*
- *Photovoltaic*
- *Insulated Concrete Forms*
- *Vegetated Roof*
- *Rainwater Catchment System*
- *Green Building Products*
- *Advanced Mechanical System*
- *Energy Modeling*



TODAY

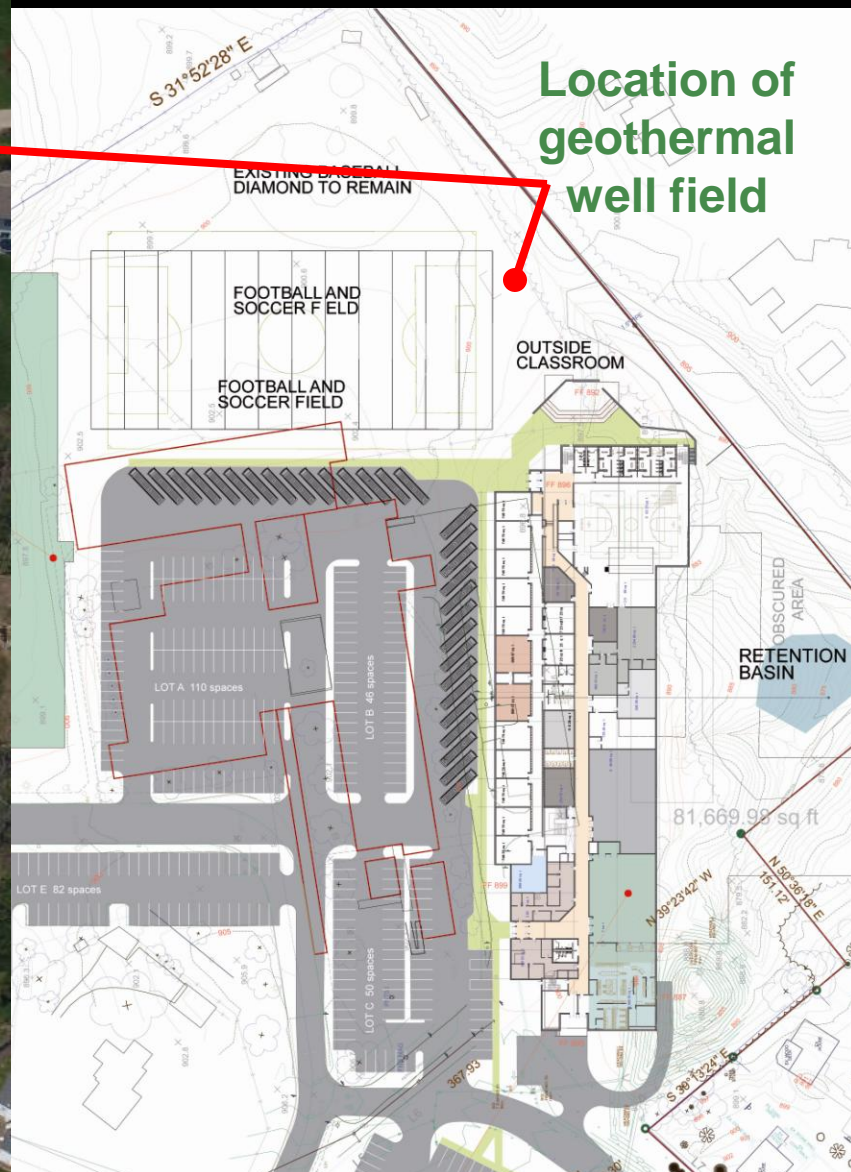
refining, expanding, innovating...

GEOHERMAL HEATING AND COOLING

- *Turkey Foot Middle School will have 136 wells compared to 144 wells at Caywood Elementary School.*
- *8 fewer wells even though building is 70% larger.*

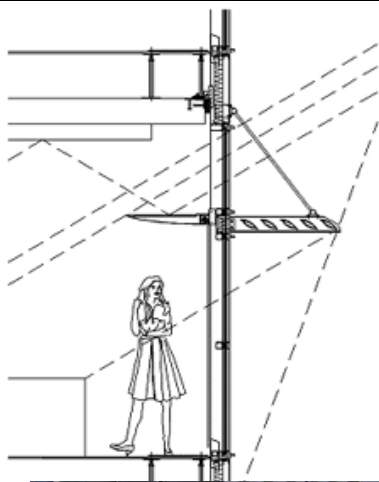
Factors contributing to this reduction include improved heat pump efficiencies, envelope improvements, and reductions due to an Aircurity outdoor air system.



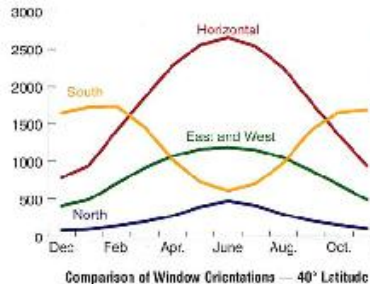


- The new Turkey Foot Middle School is approximately twice the size of the existing building and will utilize half the energy.

DAYLIGHT HARVESTING





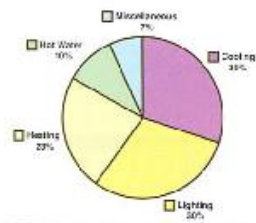


WHY IT'S BETTER

By strategically placing the majority of the windows on the south side of the school, Caywood receives the highest amount of solar radiation in the winter, when the sun is lower in the sky. In the summer, the windows are shaded by the overhangs, keeping the school cooler. The windows in the new school also have three panes and built in louvers to help minimize heat gain and glare in warmer months and heat loss in the colder months.

HOW IT SAVES

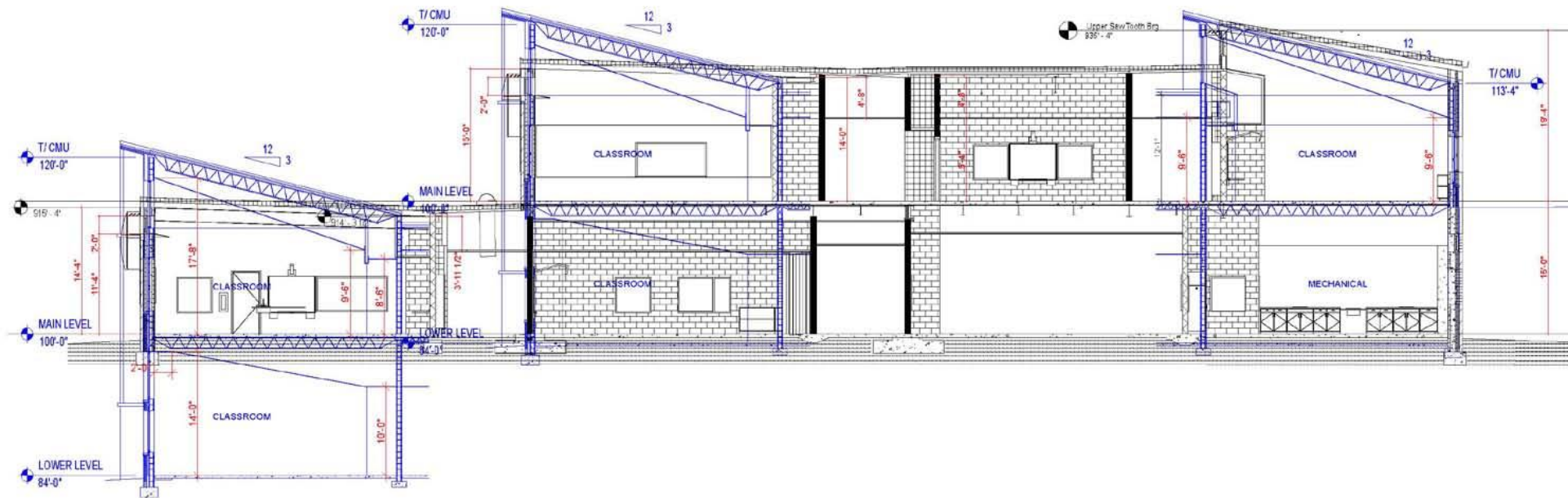
Surprising though it may seem, lighting in schools makes up about 30% of the energy used. Engaging natural light in such an effective way as DAYLIGHTING, could dramatically reduce the amount of money and energy expended by the school as a whole.



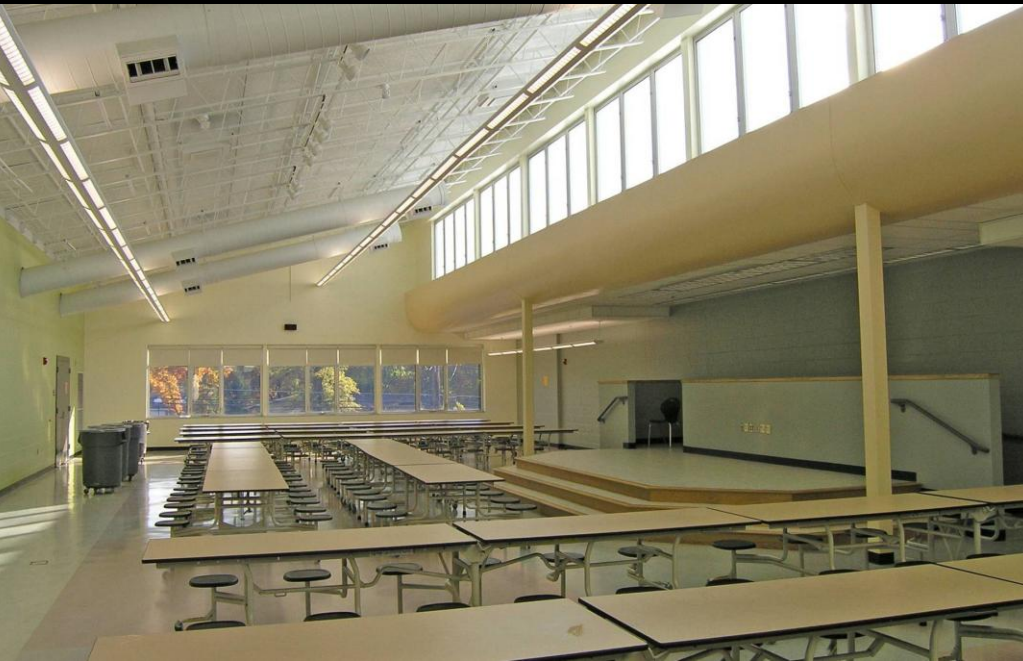
School Energy Use Distribution

In typical schools, energy is primarily used for cooling and lighting.





LIGHTING AND LIGHTING CONTROLS



ENERGY MANAGEMENT



FEATURES

- Accommodates a diverse portfolio of sensors to meet market specific applications.
- Calibration and maintenance of sensors is automatically and routinely scheduled through Aircuity's calibration depot and an Annual Sensor Services program.



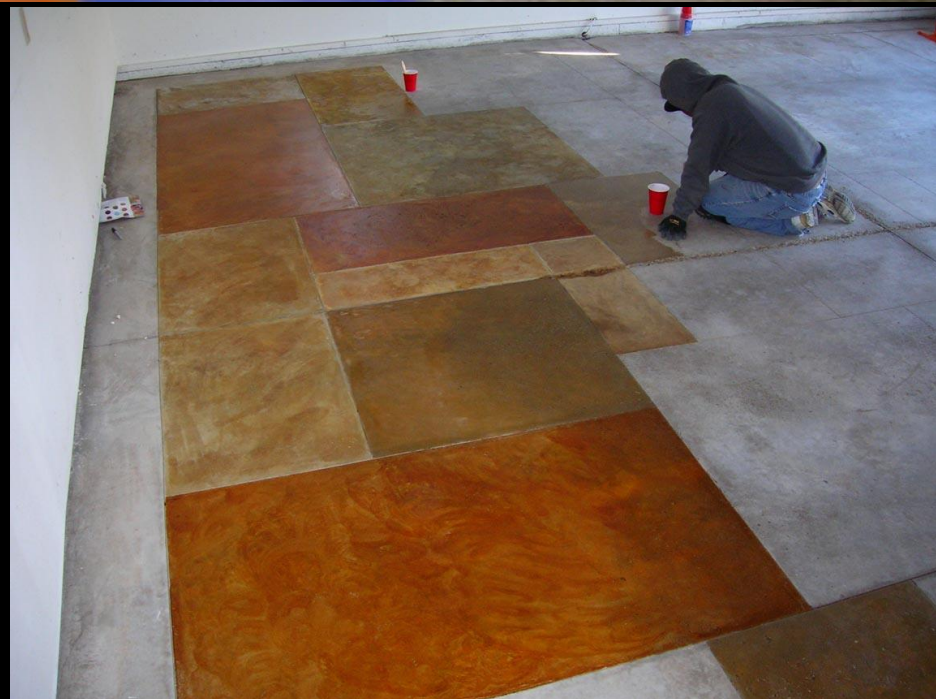
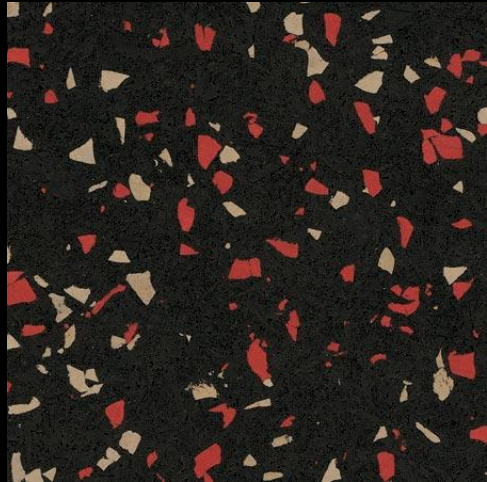
RAINWATER MANAGEMENT



BUILDING ENVELOPE



LIFE CYCLE FINISHES



POWER GENERATION

Covering the roof with photovoltaic panels would reduce energy usage from 24.3 kbtu/sf/-yr to 12.9 kbtu/sf/-yr



Crystalline Solar Panels
(12% - 20% efficiency)

Thin Film Solar Panels
(6% - 10% efficiency)

• *Thin Film Solar Panels are less efficient but they do not need direct light like the crystalline panels.....so they can produce electricity when the crystalline cannot.*





If installed the photovoltaic system would supply 46.73% of the energy required by the building and would offset 360 metric tons of CO² per year



The roof area would provide 281.7kW of thin film panels and 73.2kW of mono-crystalline panels for a combined total of 354.9kW of generation per year



SITE STORM WATER MANAGEMENT



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**Turkey Foot
Middle School**

**J.D. Patton
ATC**

**James A. Caywood
Elementary School**

STEM Campus
A Sustainable Research Campus

“We cannot always build the future for our youth, but we
can build the youth for our future”

Franklin D. Roosevelt

